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A NEW GENUS *CLYPEOLONTHA* LI AND YANG, FOR THE GENUS *MELOLONTHA* FABRICIUS (COLEOPTERA: SCARABAEOIDEA: MELOLONTHINAE) FROM SOUTHEASTERN ASIA

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Abstract.—***Clypeolontha,*** new genus, is described with *Melolontha alboplagiata* Brenske, **new combination,** as the type species. In addition, three species are herein recognized as new: ***C. siamensis, C. bertiae,*** and ***C. laosensis.*** The following information is provided for each species, when appropriate: literature review, diagnosis, description or redescription, illustration of important external characters, data for material studied, geographical distribution, and taxonomic remarks. A key to females and a distribution map to the *Clypeolontha* species are given. A preliminary discussion on the systematics of *Melolontha sensu lato* is presented.

Key Words: Melolonthinae, *Melolontha, Clypeolontha,* new genus

As the type genus of the subfamily Melolonthinae, *Melolontha* Fabricius, 1775, has attracted attention because of their diversity and agricultural importance of its species. Burmeister (1855) first treated this genus and assigned *Hoplosternus* Guérin-Méneville, 1838 and the newly defined *Schoenherria* as members of *Melolontha,* although both are later widely accepted as independent genera. Reitter (1902) proposed four groups mainly based on their geographical distributions in his division of *Melolontha,* including *Tocama,* the first subgenus from mainland China. Medvedev (1951) designated the second subgenus, *Apropyga,* under a strict concept of *Melolontha* in his faunal review.

Since these beetles are widely distributed throughout Eurasia, it is surprising that no revision encompassing the some 40 constituent species within *Melolontha* has ever been furnished to date. Most taxonomic works for *Melolontha* consist of isolated contributions. Medvedev (1951) is probably the most comprehensive study so far, particularly his subgeneric treatment, which includes all species of *Melolontha* from the former Soviet Union and adjacent regions. Nomura (1952) reviewed the northeastern Asian *Melolontha* species and described a related genus, *Tricholontha,* endemic to the Okinawa Islands, Japan. Baraud (1992) provided a identification key as well as a detailed literature review for each of the nine nominal European species of *Melolontha.* Neither of these works discussed the systematic problems of *Melolontha.*

Since the first *Melolontha* was described, several species have been removed, or established as the type species of new genera and more cases will likely be reappraised in the future. Apparently, the broad concept of *Melolontha* is a result of all allied genera being lumped together. Not only do they all share the common character of a 7-segmented antennal club, but sometimes, particularly at the earlier taxonomic works, merely an enlarged antennal club. The type

species of the genus *Cyphochilus* Waterhouse, 1867, *C. candidus* (Olivier 1789), is an obvious example with a 3-segmented enlarged club in males and previously considered a *Melolontha*. Thus, a reasonable classification system within the whole subtribe Melolonthina also needs further construction and analysis. Most recently, Baraud (1992) provided two other diagnostic characters, namely the membranous margin of the elytra and the number of antennal club segments in females, to seperate *Melolontha* from *Polyphylla* Harris, 1941. These two characters and the ratio between eye and interocular width used by Nomura (1952) are characters (in addition to male antennal segments) employed to distinguish *Melolontha* from other related taxa.

In fact, most of those genera closely related to *Melolontha* (i.e., *Polyphylla* Harris, *Schoenherria* Burmeister, 1855 and *Exolontha* Reitter, 1901) are most diverse and are mainly distributed in or restricted to East and Southeast Asia. However, we will provide further information with broad evolutionary implications to those, described or undescribed, taxa closely related with *Melolontha sensu lato* which based on cladistic analysis within the next complementary work and this is the first part we refer to the taxonomic assessment of *Melolontha sensu lato* (see also Systematics).

Material and Methods

Specimens used in this study were borrowed from and deposited in the institutions referred to in the section of material or type. The acronyms follow Arnett et al. (1993) and are listed below.

BMNH: The Natural History Museum, London, U.K.; Malcolm Kerley.

ISNB: Institut Royal des Sciences Naturelles de Belgique, Bruxelles, Belgium; Konjev Desender and Marcel Cludts.

MNHA: Museum of Nature and Human Activities, Hyôgo, Japan; Yoshihisa Sawada.

MNHN: Muséum national d'Histoire naturelle, Paris, France; Jean J. Menier and Nicole Berti.

NMNH: National Museum of Natural History, Taichung, Taiwan; Mei-Ling Chan.

NTUI: Insect Museum, Department of Entomology, National Taiwan University, Taipei, Taiwan; Tung-Ching Hsu.

TARI: Taiwan Agricultural Research Institute, Taichung, Taiwan; Liang-Yih Chou.

ZMNB: Museum für Naturkunde der Humboldt-Universität, Berlin, Germany; Hella Wendt and Joachim Schulze.

Observation and measurements of external characters were made using an ocular micrometer. Male genitalia were dissected and cleaned using 10% KOH solution for few days, then stored in glycerine in microvials and attached to specimens from which they have been removed.

The specimen label data has been abbreviated to indicate as a handwritten (H) or a printed (P) data respectively. Separate labels are indicated by double slashes from another while specimens with two more ones. The information on geographical distribution is referred from label data.

The measurements and ratios that are considered to be useful in the separation of *Clypeolontha* species are briefly summarized in Table 1. Abbreviations for characters and mensural procedures are listed as follows:

BL body length, measured from anterior margin of clypeus to the apex of elytra.

BW body width, measured across elytral humeri.

BW/HW ratio of body width to head width across eyes in female.

MPR ratio of maximum length of female maxillary palpi 2–4.

ASR ratio of length of male antennal basal segments 1–3.

Table 1. Summary of selected descriptive measurements and ratios for species of *Clypeolontha*: range, mean and standard deviation.

Taxa (n)	Body length (BL), mm	Body width (BW), mm	BL/BW	MFL/W	PgW/L
C. siamensis	16.4–19.6	8.0–9.0	2.05–2.21	2.93–3.21	1.08–1.22
Male (21)	18.4 (0.84)	8.65 (0.31)	2.13 (0.06)	3.06 (0.06)	1.15 (0.38)
Ditto, female (8)	19.7–20.7	9.3–10.0	2.04–2.17	2.34–2.56	1.17–1.25
	20.2 (0.22)	9.6 (0.32)	2.09 (0.05)	2.45 (0.08)	1.21 (0.06)
C. alboplagiata	16.8–17.0	7.8–8.0	2.13–2.15	2.42–2.50	1.00–1.03
Male (4)	16.9 (0.1)	7.9 (0.1)	2.14 (0.01)	2.46 (0.04)	1.02 (0.02)
Ditto, female (3)	19.8–20.1	8.8–9.0	2.23–2.25	2.08–2.18	1.11–1.14
	19.95 (0.15)	8.9 (0.1)	2.24 (0.01)	2.13 (0.05)	1.125 (0.01)
C. bertiae (5)	17.9–18.5	7.8–7.9	2.28–2.36	2.34–2.45 (n = 4)	1.08–1.12
	18.2 (0.3)	7.9 (0.06)	2.36 (0.01)	2.40 (0.08)	1.10 (0.02)
C. laosensis (1)	17.2	7.5	2.29	2.61	1.18

PTR ratio of maximum length of protarsomeres 1–5.

MFL/W ratio of length of metafemur to its maximum width in ventral aspect.

PgW/H ratio of height of pygidium to its maximum width in dorsal aspect.

Systematics

The taxonomic legacy surrounding the members of the genus *Melolontha sensu lato* has sufferred many changes in position. These situations may become more complicated as more new taxa are discovered. We consider that the lack of systematic research related to the genera of *Melolontha*, especially *Hoplosternus,* and lack of taxonomic characters that clearly delimit all closely related genera, are apparently the reasons for confusion regarding the classification of melolonthine taxa. Since we recently acquired many related taxa from various geographical areas and the senior author has seen many types and other specimens from several European institutions, it was felt time is appropriate to make a new definition of *Melolontha.* Therefore, the establishment of new genus *Clypeolontha* is herein proposed to accommodate those questionable taxa, in part, presently assigned to *Melolontha sensu stricto.* Several other taxa are also in need of a reassessment in their taxonomic placement but will be discussed at a later date.

Through examinations of 25 of 41 currently valid species in *Melolontha* and 20 of 29 species in *Hoplosternus,* we present the following diagnostic characters, based mainly on the type species, *Melolontha melolontha* L. for *Melolontha sensu lato:* (1) presence of metallic coppery with some green or purple coloration on head, pronotum, scutellum and femora when surface setae are removed; (2) overall punctation of pronotum usually coarser and sparser with varied distribution; (3) each elytron with 5 discal costae including 1 along epipleural margin; (4) lateral sides of abdominal sterna 1–6 usually with a lighter maculation, although on sternite 6 sometimes less developed; and (5) male genitalia in general symmetrical, apex of parameres usually obliquely truncate and swollen when viewed laterally, in frontal aspect with trapezoid to broad bean-like swelling, dorsal portion with hook apically. In the time past, *Melolontha* and *Hoplosternus* were differentiated based only on the appearance and development of mesosternal process. Arrow (1913) first argued against this character when he wrote that the male of *M. guttigera* Sharp lack the mesosternal process while the female has one. However, we have examined many determined specimens of *M. guttigera* and found that both sexes did

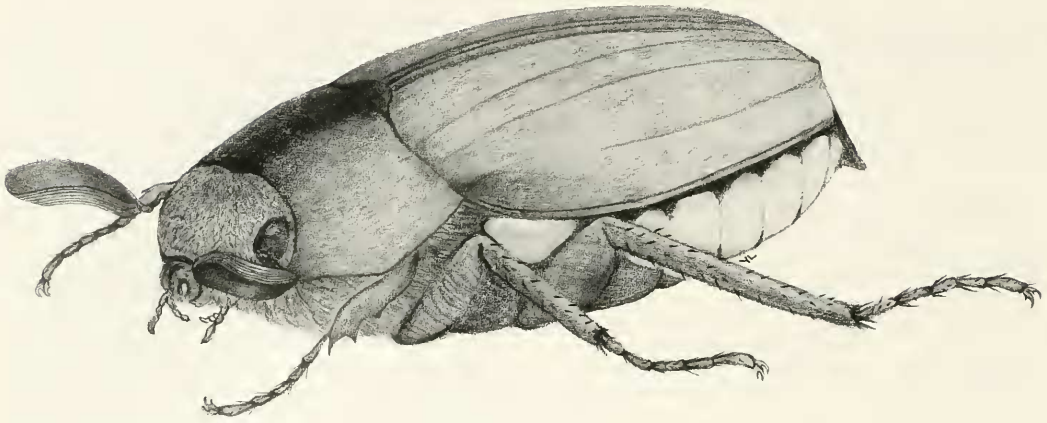


Fig. 1. *Clypeolontha siamensis*.

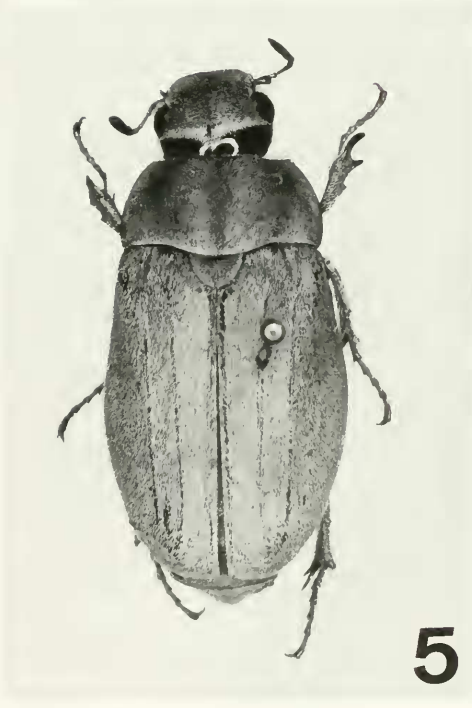
have the mesosternal process although the male has a remarkably less-developed one than female. Regardless, it is our view that the genus *Melolontha* is probably paraphyletic when *Hoplosternus* is treated as an independent derivative from *Melolontha*. The only distinctive character, the mesosternal process, used to separate *Hoplosternus* from the other taxa is subject to a broad transitional intra/inter-specific variation, and it is also commonly found in many genera of Scarabaeidae. Thus, this character, a plesiomorphic feature, is useless for recognition of *Hoplosternus* as an independent genus and we will present a formal taxonomic treatment in the future. Furthermore, as will be proposed cladistically elsewhere (Li in preparation), members of the true *Melolontha* lineage are defined by the above-mentioned synapomorphies (1), (2), (4), and (5). All of these characters are shared by *Melolontha* and *Hoplosternus*. It is unlikely that these structures evolved twice because they are found in the same geographical distributions of Eurasia with a sympatric distribution pattern and have not been discovered elsewhere.

Brenske (1898) described *M. alboplagiata* (here referred to as *Clypeolontha*), based only on a single female specimen. Even lacking a male, Brenske still assigned this species to a member of *Melolontha* probably because its wide maculation continuously located along the lateral sides of abdominal sternites 1–6 makes it morphologically closed to *Melolontha* than the other genera. However, this character is not shared by *Melolontha* and is one of autapomorphic characters defining our new genus. Fortunately, we obtained a series of both sexes collected from the type locality and neighboring areas. These were compared with the type and other related taxa from Southeast Asia respectively. Therefore, we here propose the new genus, *Clypeolontha* for *M. alboplagiata* together with three other new species.

Clypeolontha Li and Yang, new genus

Type species. *Melolontha alboplagiata* Brenske 1898: 236, here designated.

Diagnosis.—The following combination of characters separate *Clypeolontha* from all other related genera within the subtribe Melolonthina. Body oblong, subparallel-sided medially, smaller (16.4–19.6 mm), and absence of metallic coloration or reflection on body surface, antennae, and legs. Head surface densely rugose, clypeus shallowly depressed, emarginate centrally exposing labrum when viewed dorsally. Pronotal surface densely punctate, punctures evenly distributed, each with a seta subequal in length, lateral margins very weakly and incompletely serrate; pro- and mesosternal processes vestigial. Pretarsus



Figs. 2–5. Dorsal habitus. 2, *Clypeolontha siamensis*, holotype male. 3, *C. alboplagiata*, male. 4, *C. siamensis*, female. 5, *C. alboplagiata*, holotype female.

small, subapical tooth one-half to two-thirds length of apical claw. Metepisternum and metepimeron densely covered with scales. Six visible abdominal sternites with lateral maculation on ventrites 1 through 6, narrowest on ventrite 1, expanding obliquely towards middle through to about ventrite 4 and decreasing 5 in width through to 6, which maculation consisting of dense white scales with faint iridescent-tinged reflection continuous throughout the lateral edges. Paramere of male genitalia asymmetrical.

Etymology.—The prefix of the generic name is derived from the Latin combining form *clypeo-*, reflecting distinctive character of clypeus on both sexes among species, and the suffix is partly taken from the genus *Melolontha* showing their close relationship. The gender is feminine.

Key to Females of *Clypeolontha*

The key is based on females only; males material were not available for two species in this study. However, we consider that the distinguishing characters employed herein are constant throughout each species. Additionally, we provide a diagnosis to the species with male specimens compared.

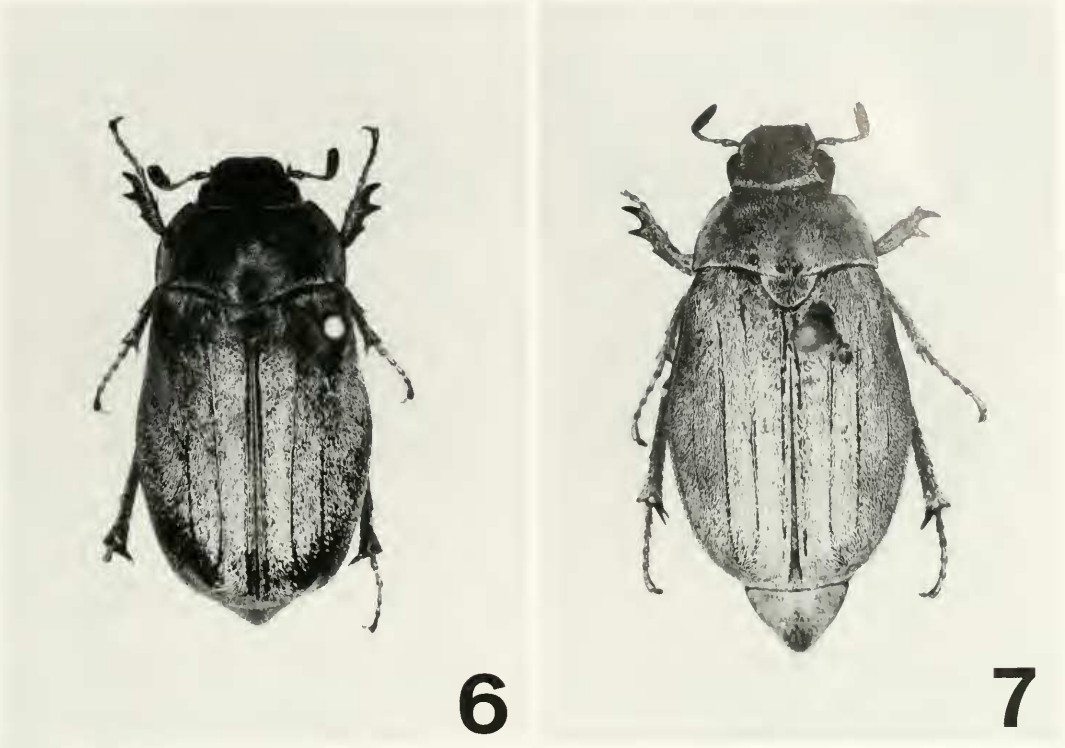
1. Body size larger (BL ≧ 19.7 mm, BW ≧ 8.8 mm, BL/BW ≦ 2.25; surface usually clothed with yellowish-brown to whitish-yellow setae . . 2
– Body size smaller; pronotal and elytral surfaces clothed with pale white to yellow setae 3
2. Labrum triangular (Fig. 11); apical maxillary palpomere spindly elongate, longer than combined segments 2–3 (Fig. 43) (mean MPR = 1.6:1.3:3.7); pronotal midline not visible, angles obtuse (Fig. 13); mean BW/HW = 1.64; hind femur broadly stout (Fig. 19) (MFL/W = 2.08–2.18); abdominal sternite 5 with posterior edge smooth (Fig. 25); apex of pygidium somewhat sharpened (Fig. 31); PgW/H = 1.11–1.14; Sikkim and Bhutan . . . . . *C. alboplagiata* Brenske
– Labrum rounded (Fig. 10); apical maxillary palpomere elongate, bulged centrally, subequal to combined segments 2–3 (Fig. 42) (mean MPR = 1.9:1.4:3.5); pronotal midline shallowly depressed, angles acute (Fig. 12); mean BW/HW = 1.84; hind femur stout (Fig. 17) (MFL/W = 2.34–2.56); abdominal sternites 5 and 6 anteriorly point-curved medially (Fig. 25); pygidium broadened basally with apex rounded and inflated (Fig. 29); PgW/H = 1.17–1.25; northern Thailand . . . . . *C. siamensis*, n. sp.
3. Clypeus very shallowly depressed anteriorly; apical maxillary palpomere spindly elongate, equal to combined length of segments 2–3 (Fig. 44) (mean MPR = 2.0:1.5:3.5); pronotal disc moderately convex with finely punctate, evenly distributed, midline not visible, angles weakly protuberant (Fig. 14); mean BW/HW = 1.73; protibial spur subequal to one-fourth length of first pretarsomere; hind femur roundly inflated (Fig. 20) (MFL/W = 2.34–2.45); posterior edges of abdominal sternites 5 and 6 smooth, sternite 6 with feeble irregular serration (Fig. 26); pygidium clothed with pale white to yellowish-brown setae, moderately elongate with apex sharpened (Fig. 32); PgW/H = 1.08–1.12; western Laos and northeastern Thailand . . . . . *C. bertiae*, n. sp.
– Clypeus moderately depressed anteriorly; apical maxillary palpomere spindly stout, shorter than combined length of segments 2–3 (Fig. 45) (MPR = 1.8:1.3:2.7); pronotal disc weakly convex with irregularly distributed punctures, midline shallowly depressed, bearing tiny brownish setae, anterior angle acute, posterior angles obstuse (Fig. 15); BW/HW = 1.91; protibial spur subequal to one-third length of first pretarsomere; hind femur slightly transversely inflated (Fig. 21) (MFL/W = 2.61); posterior edge of abdominal sternite 5 distinctly point-curved, sternite 6 strongly arc-curved medially (Fig. 27); pygidium clothed with yellowish brown setae, slightly elongate with apex rounded (Fig. 33); PgW/H = 1.18; central northeastern Laos . . . . . *C. laosensis*, n. sp.

Clypeolontha siamensis Li and Yang, new species

(Figs. 1, 2, 4, 8, 10, 12, 16, 17, 22, 25, 28, 29, 34, 35, 36, 37, 42)

Melolontha alboplagiata Brenske: *sensu* Itoh 1995: 202 (distribution, new record).

Type series.—Holotype ♂ (deposited in NTUI as DPPE-9702): N. THAILAND: Chiang Mai Prov., Fang, 9.V.1995. Paratypes (18 ♂, 7 ♀) as follows: same data as holotype: 9 ♂, 4 ♀; 1 ♂, 25.IV.1995; the remaining 6 ♂ and 2 ♀, Chiang Rai Prov., Wiang Pa Pao, all on 1.V.1995 but 1 ♂ on 5.IV.1995 (2 ♂ paratypes deposited in BMNH; 2 ♂ in TARI; 3 ♂ and 2 ♀ in NMNH; 3 ♂ and 2 ♀ in ZMHB; 3 ♂ in



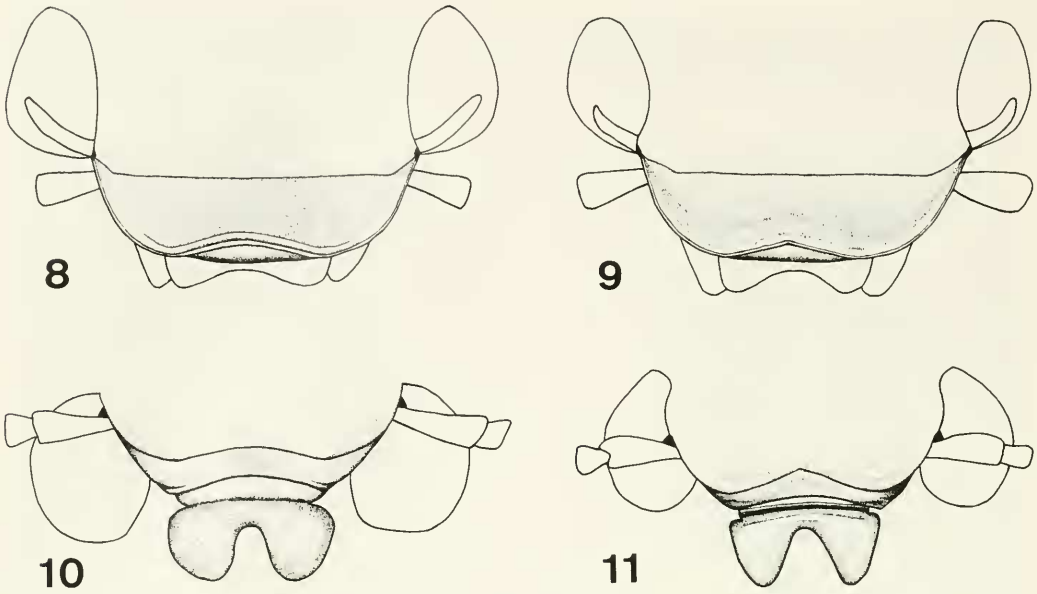
Figs. 6–7. Dorsal habitus. 6, *Clypeolontha laosnesis*, holotype female. 7, *C. bertiae*, holotype female.

ISNB); 1 ♂ dated May 27, 1990 from Wiang Papso, N. Thailand and 1 ♀ dated May 1, 1988 from Samoeng, near Chiang Mai, N. Thailand in Takeshi Itoh's collections; 1 ♂ dated May 10–13 from Doi Song, near Chiang Mai in MNHA The remaining paratypes, 3 ♂ and 2 ♀ are deposited in NTUI and the authors' collections, respectively.

Male diagnosis.—Antennal club 2.3–2.7 times length of stem; mean ASR = 2.1:0.7:1.3; labrum shape rounded; pronotal midline very shallowly depressed, angles acute; protarsomere 1 shorter than combined length of protarsomeres 2 and 3 (PTR = 3.0:1.7:1.6:1.6:2.7); hind femur stout (MFL/W = 2.93–3.21); abdominal sternite 5 with posterior edge moderately arc-shaped centrally; apex of pygidium distinctly prolonged, longitudinally convex, PgW/H = 1.08–1.22; paramere apex irregularly broadened, right paramere with a inward spine on basal one-fourth.

Description.—Male. *Body:* Oblong (Figs. 1, 2), sides subparallel medially. Dorsal surface densely covering with short yellowish-brown to whitish-yellow setae, same in length. BL = 16.4–19.6 mm; BW = 8.0–9.0 mm; BL/BW = 2.05–2.21. Basal color blackish brown to yellowish brown.

Head: Surface densely to confluently punctate, punctures moderately large, each bearing a short seta. Antenna 10-segmented with 7-segmented club; lamellae slightly outwardly curved, 2.3–2.7 times length of stem; first basal segment wider than third one; mean ASR = 2.1:0.7:1.3. Clypeus transverse, shallowly depressed anteriorly, weakly emarginated; sides gradually rounding to biarcuate apex; middle of anterior margin shallow and smooth (Fig. 8); clypeo-frontal suture moderately developed; frons slightly narrowed, making eyes large. Labrum weakly to moderately grooved with respect to clypeus; transversally symmetrical, rounded and strongly bilobed, one-third



Figs. 8–11. Labrum. 8, *Clypeolontha siamensis,* dorsal view. 9, *C. alboplagiata,* dorsal view. 10, *C. siamensis,* front view. 11, *C. alboplatiata,* front view. Scale line = 2.0 mm.

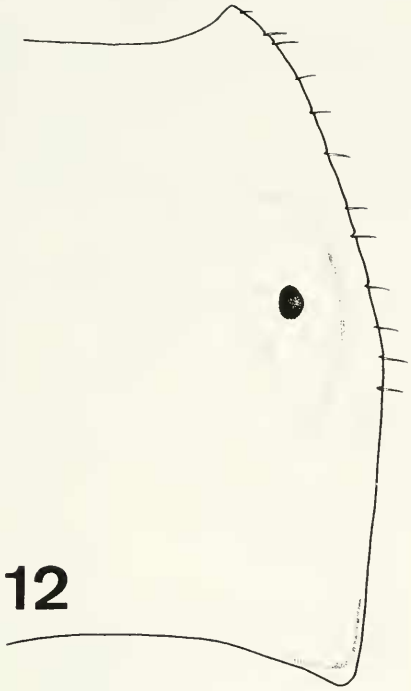
width of clypeal base, depressed laterally (Fig. 10); visible dorsally, moderately protuberant. Maxillary palpus light yellowish brown, 4-segmented; apical palpomere spindly elongate, truncate, centrally bulged, longer than combined length of palpomeres 2–3, each with a dorsal concavity. Labial palpus 3-segmented; apical palpomere subcylindrical and glabrous.

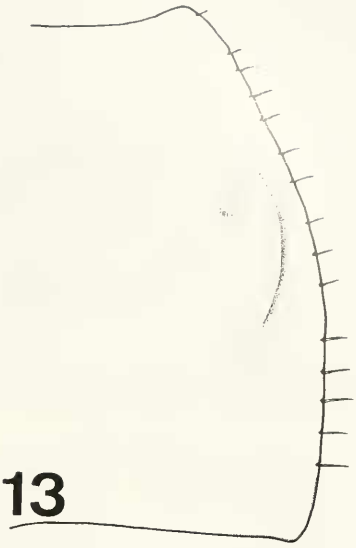
Pronotum: Moderately transverse to subquadrate, widest at middle, slightly narrowing posteriorly, weakly convex. Surface densely punctate, punctures evenly distributed, each with a short seta; anterior margin weakly emarginate. Midline very shallowly depressed and always covered with less stout and somewhat shorter setae than lateral. Discal sides of pronotum irregularly convex at middle, each with a varied pit (Fig. 12). Laterally, marginal serration poorly developed; both anterior and posterior angles acute, moderately protuberant (Fig. 12). Scutellum wider than long, apically rounded, moderate in size.

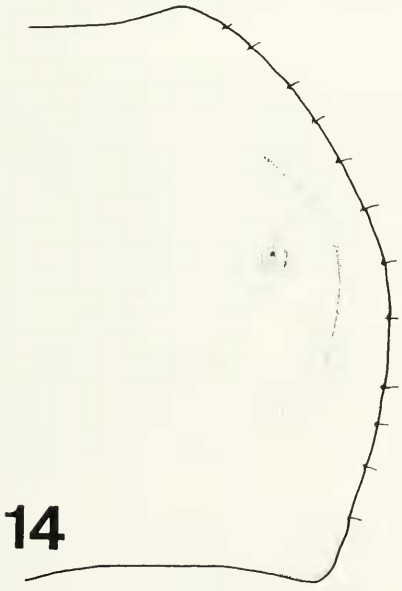
Elytron: Randomly distributed with zero to seven small dark tubercles, sometimes only vestigial. Surface with 5 parallel costae including epipleural and sutural margin. Costae 2 and 3 fused on apical knobs. Costa 4 very feebly developed and sometimes hardly visible. Intervals slightly impressed and with setiferous punctures throughout. Humeral knobs moderately swollen. Epipleuron with aligned row of entire setae, broadest at middle. Lateral and apical margin membranous.

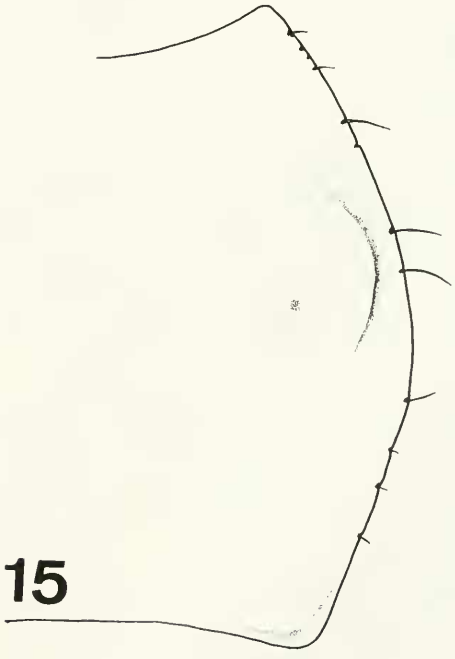
Thoracic sternites: Surface hairy with except metepisternum and metepimeron densely covered with whitish-yellow scales with slightly iridescent tinge (with illumination and magnification). Mesosternum transverse, surface of disc and mesometasternal suture depressed. Metasternum large subquadrate, weakly depressed along middle groove.

Legs: Protibia tridentate, tooth color distinctly darker than disc; basal tooth somewhat vestigial; anterior spur movable, un-

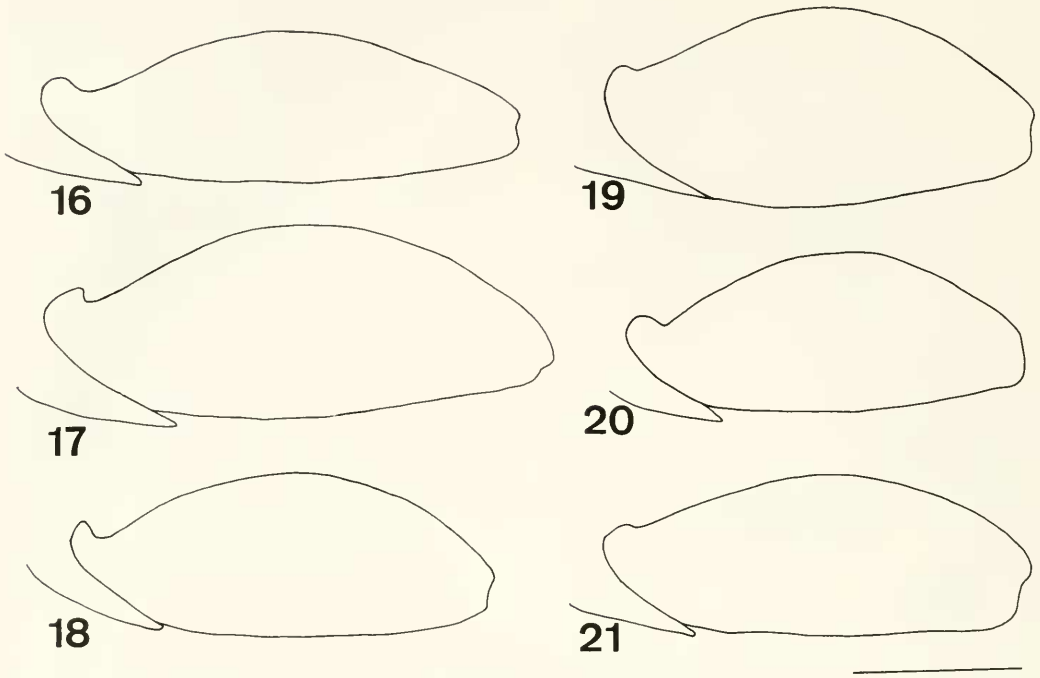








Figs. 12–15. Pronotum. 12, *Clypeolontha siamensis*. 13, *C. alboplagiata*. 14, *C. bertiae*. 15, *C. laosensis*. Scale line = 1.0 mm.

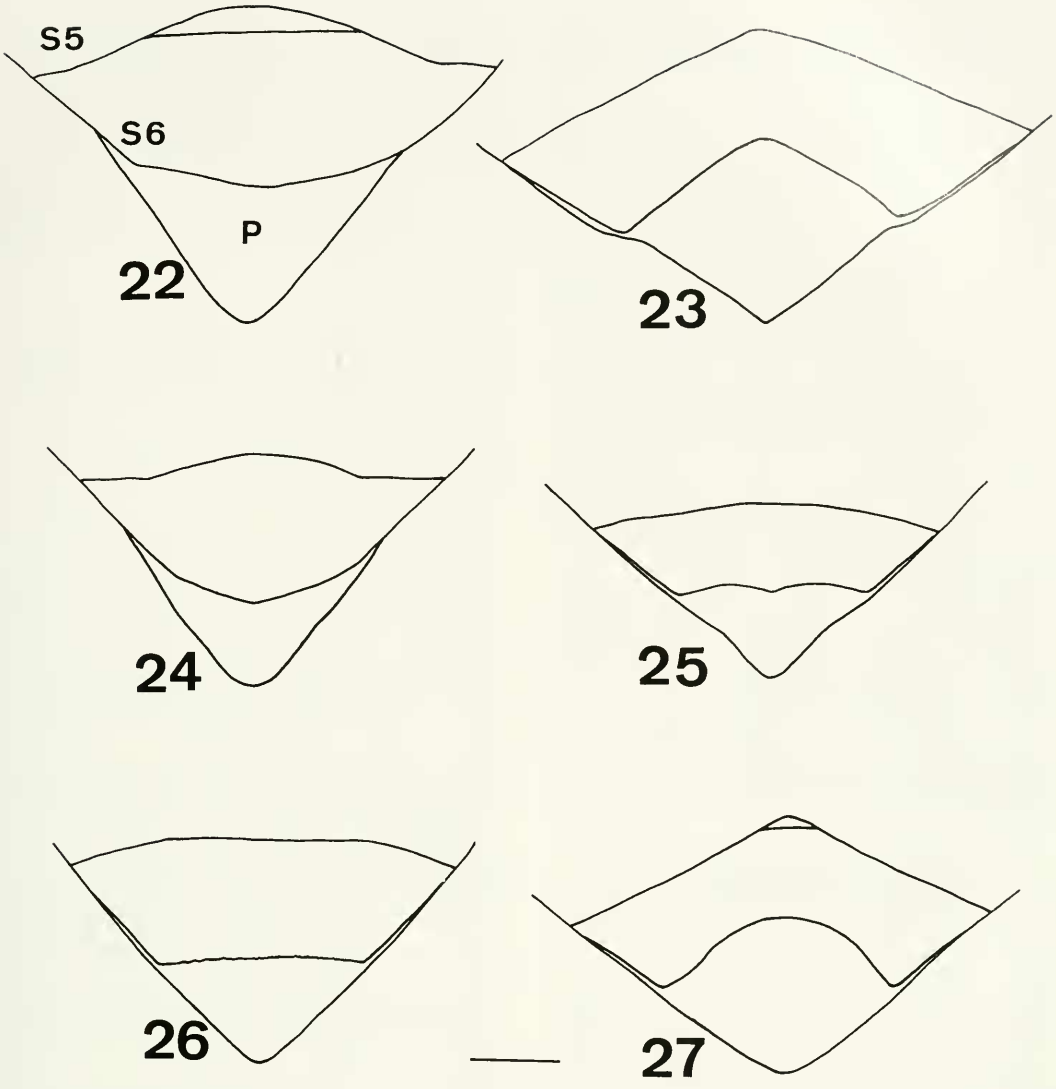


Figs. 16–21. Outlined hind femur. 16, *Clypeolontha siamensis*, male. 17, *C. siamensis*, female. 18, *C. alboplagiata*, male. 19, *C. alboplagiata*, female. 20, *C. bertiae*, female. 21, *C. laosensis*, female. Scale line = 2.0 mm.

dersized, subequal to one-fourth length of first protarsomere. Claws symmetrical, abruptly curved apically with a vertical subapical tooth at middle, one-half to two-thirds length of apical tooth. Protarsomere 1 shorter than combined length of protarsomeres 2–3; PTR = 3.0:1.7:1.6:1.6:2.7. Pro- and mesofemora transversely flattened, surface densely clothed with long, yellowish white pile. Hind femur stout (Fig. 16) with shorter pile than that on pro- and mesofemora, about 2.5 times as wide as tibia, broadest at middle; MFL/W = 2.93–3.21. Tibiae and tarsi moderately clothed with pale white setae. Meso- and metatibia with two elongate, apical spurs, outer spur of metatibiae sharper and slightly longer than length of metatarsomere 1, inner spur curved apically. Meso- and metatarsi light yellowish brown with tarsomeres 1–5 subequal in length.

Abdomen: Sternites moderately punctate; segments 1–6 continuous with wide maculation along lateral edges consisting of white scales with weakly iridescent tinge. Intervening surface shallowly setiferously punctate, with less stout and more sparsely distributed setae than those on dorsum; transversely sparsely intermixed with longer setae. Sternites 2–5 weakly fused medially, not well defined. Sternite 5 with posterior margin moderately arc-shaped centrally sometimes exposing intersegmental membrane (Fig. 22). Pygidium triangular; apex distinctly prolonged, longitudinally convex, somewhat abruptly declivious on apical one-fourth when viewed laterally (Fig. 28); width approximately equal to length; PgW/H = 1.08–1.22; marginate laterally and becoming smooth apically. Dorsal and ventral surface densely covered with tiny setae same as on dorsum, sparsely intermixed with longer setae which becoming denser on apical margin.

Male genitalia: Parameres strongly asymmetrical with apices irregularly broad-



Figs. 22–27. Outlined abdominal sternites 5–6 in ventral view. 22, *Clypeolontha siamensis*, male. 23, *C. siamensis*, female. 24, *C. alboplagiata*, male. 25, *C. alboplagiata*, female. 26, *C. bertiae*, female. 27, *C. laosensis*, female. S = sternite; P = pygidium.

ened, contracted dorsomedially, and fused at base (Fig. 34); right paramere with a inward spine on basal fourth and not fused when viewed ventrally (Fig. 35). In lateral aspect parameres asymmetrically concave and sharpened forwardly (Figs. 36, 38). Basal piece and paramere approximately equal in length.

Female.—BL = 19.7–20.7 mm.; BW = 9.3–10.0 mm; BL/BW = 2.04–2.17. Similar to male except with stouter and more robust shape (Fig. 4); BW/HW = 1.76–1.94, mean = 1.84; antennal club 6-segmented, compact and club length longer than basal segments 2–4, the first club segment one-half to one-third length of rest, three basal segments each one-half as wide as first one; apical segment of maxillary palpus subequal to combined length of segments 2–3; mean MPR = 1.9:1.4:3.5 (Fig.

42); protibia broader and more robust, anterior tooth broadened; mean PTR: 3.0:1.2:1.1:1.2:2.5; hind femur stouter and more rounded (Fig. 17); MFL/W = 2.34–2.56; the longer metatibial spur more or less stouter; abdomen dorsoventrally inflated; posterior edges of abdominal sternites 5 and 6 anteriorly with point-curved medially (Fig. 23); pygidium broadened basally with apex roundly inflated, slightly elongate and concave in lateral view (Fig. 29); PgW/H = 1.17–1.25.

Distribution.—Montane areas of northern Thailand near the border of Burma (Myanmar) (Fig. 46).

Remarks.—Itoh (1995) misidentified several specimens of this species as *C. alboplagiata* which were collected from the neighboring areas of the type locality, although he noted differences of the relative length of the first antennal club segment and the remainder in the female.

Etymology.—The specific epithet is named for Siam, the former name of collecting place of this species.

Clypeolontha alboplagiata (Brenske), **new combination**
(Figs. 3, 5, 9, 11, 13, 18, 19, 24, 25, 30, 31, 37, 39, 40, 41, 43)

Melolontha alboplagiata Brenske 1898: 236 (*nec* Itoh, 1995: 202); Dalla Torre 1912: 267 (catalog); Sabatinelli 1993: 615 (catalog).

Male diagnosis.—Male: Antennal club about 2.2 times length of stem; mean ASR = 1.3:0.5:1.8; labrum shape triangular; pronotal midline not observed, angles obtuse; protarsomere 1 longer than combined length of protarsomeres 2 and 3 (PTR = 3.0:1.2:1.1:1.2:2.5); hind femur broadly stout (MFL/W = 2.42–2.50); abdominal sternite 5 with posterior edge slightly arc-shaped centrally; apex of pygidium moderately prolonged; PgW/H = 1.00–1.03; paramere strongly curved laterally at basal one-fourth, oblique ridge along right paramere, apex turned inwardly and thinned apically.

Description.—Male. *Body:* Oblong (Fig. 3), sides subparallel medially Dorsal surface densely covered with short yellowish-brown to whitish-yellow setae, all similar in length. BL = 16.8–17.0 mm; BW = 7.8–8.0 mm; BL/BW = 2.13–2.15. Basal color reddish brown.

Head: Surface densely to confluently punctate, punctures moderately large, each bearing a short seta. Antenna 10-segmented with 7-segmented clubs; lamellae slightly outwardly curved, about 2.2 times length of stem; first basal segment wider than third one; mean ASR = 1.3:0.5:1.8. Clypeus transverse, shallowly depressed anteriorly, weakly emarginated; sides gradually rounding to biarcuate apex; middle of anterior margin inwardly depressed at tip (Fig. 9); clypeo-frontal suture moderately developed; frons slightly narrowed making eyes large. Labrum moderately grooved with respect to clypeus; transversally symmetrical, strongly bilobed and each triangular, one-third width of clypeal base, depressed laterally (Fig. 11), visible dorsally, moderately protuberant. Maxillary palpus light yellowish brown, 4-segmented; apical palpomere spindly elongate, truncate, subequal in length to palpomeres 2–3, each with a dorsal concavity. Labial palpus 3-segmented; apical palpomere subcylindrical and glabrous.

Pronotum: Moderately transverse, widest at middle, slightly narrowing posteriorly, weakly convex. Surface densely punctate, punctures evenly distributed, each with a tiny seta; anterior margin weakly emarginate. Midline not visible. Discal sides of pronotum irregularly convex at middle, each with a vestigial concavity (Fig. 13). Laterally, marginal serration poorly developed with feeble emargination, anterior and posterior angles obtuse, less protuberant (Fig. 13). Scutellum wider than long, apically rounded, moderate in size.

Elytron: Surface with 5 parallel costae including along epipleural margin and su-

tural margin. Costae 2 and 3 fused on apical knobs of elytron. Costae 4 very feebly developed and sometimes hardly visible. Intervals slightly impressed and with setiferous punctures throughout. Humeral knobs moderately swollen. Epipleuron with aligned row of entire setae, broadest at middle. Lateral and apical margins membranous.

Thoracic sternites: Surface hairy except metepisternum and metepimeron densely covered with whitish-yellow, slightly iridescent scales (with illumination and magnification). Mesosternum transverse, surface of disc and mesometasternal suture depressed. Metasternum large, subquadrate, weakly depressed along middle groove.

Legs: Protibia tridentate, tooth color distinctly darker than disc; basal tooth somewhat vestigial; anterior spur movable, undersized, subequal to one-fourth length of first protarsomere. Claws symmetrical, abruptly curved apically with a vertical subapical tooth at middle, one-half to two-thirds length of apical tooth. Protarsomere 1 longer than combined length of protarsomeres 2 and 3; mean PTR = 3.0:1.2:1.1:1.2:2.5. Femora of front and middle legs transversely flattened, surface densely clothed with long, yellowish-white pile. Hind femur more stout broadly (Fig. 18) with shorter pile than that on pro- and mesofemora; about 2.5 times as wide as tibia, broadest at middle; MFL/W = 2.42–2.50. Tibiae and tarsi moderately clothed with pale white setae. Meso- and metatibiae with two elongate, apical spurs, outer spur of metatibia sharper and slightly longer than length of metatarsomere 1, inner spur curved apically. Meso- and metatarsi light yellowish brown with tarsomeres 1–5 subequal in length.

Abdomen: Sternites moderately punctate; segments 1–6 continuous with wide maculation along lateral edges consisting of white scales with weakly iridescent tinge. Intervening surface shallowly setiferously punctate, with less stout and more sparsely distributed setae than those on dorsum; transversely sparsely intermixed with longer setae. Sternites 2–5 weakly fused medially, not well defined. Sternite 5 with posterior edge deeply, angularly emarginate (Fig. 24). Pygidium triangular; apex moderately prolonged and somewhat weakly depressed on apical one-third when viewed laterally (Fig. 30); width subequal to length; PgW/H = 1.00–1.03; marginate laterally and becoming smooth apically. Surface densely covered with tiny setae as on dorsum, sparsely intermixed with longer setae and becoming denser on apical margin.

Male genitalia: Paramere moderately asymmetrical, strongly curved laterally at basal one-fourth and fused at base; oblique ridge along right paramere to fused base (Fig. 40). Apex turned inwardly and thinned apically when viewed ventrally (Fig. 41). In lateral aspect, paramere at basal one-third concave and sharpened anteriorly (Figs. 37, 39). Basal piece and paramere approximately equal in length.

Redescription of female.—Body and legs dark brown to reddish brown; clothed with pale white setae (Fig. 5). BL = 19.8–20.1 mm.; BW = 8.8–9.0 mm; BL/BW = 2.23–2.25. Sexual dimorphism in stouter shape with dorsoventrally convex; BW/HW = 1.62–1.66, mean = 1.64; surface clothed with stouter pale white setae; antennal club 6-segmented, compact length subequal to basal segments 2–4, first club segment one-fourth length of rest, third basal segments each half as wide as first; apical segment of maxillary palpus longer than the combined length of segments 2–3; mean MPR = 1.6:1.3:3.7 (Fig. 43); protibia broader and more robust; anterior tooth longer than in male and broadened; mean PTR = 3.0:1.1:1.1:1.2:2.8; anterior and posterior angle of pronotum obtuse, less protuberant; hind femur stouter and roundly inflated (Fig. 19), MFL/W = 2.08–2.18; longer metatibial spur somewhat stouter than in male; abdomen dorsoventrally inflated; posterior edge of abdominal sternite 5 smooth, sternite 6 shallowly biarcuate (Fig. 25); pygidium broadened basally with apex somewhat

sharpened; slightly elongate and concave in lateral view (Fig. 31); PgW/H = 1.11–1.14.

Material examined.—Holotype ♀ at ZMHB labeled separately as follows: "Type(P)//India, Sikkim, ex coll. Fruhstorfer(P)//coll. Brenske(P)//Melolontha alboplagiata, type, Brsk, (H)//Zool. Mus Berlin(P). 2 ♂ and 1 ♀ are placed in ISNB labeled as: Sikkim, Kurseong, R. P. Bretaudeau, 1894(P)//ex Museo Oberthur(P)(1 ♂). British Bootang, L. Durel, 1899(P)//ex Museo Oberthur(P)(1 ♂ and 1 ♀). 2 ♂ and 1 ♀ in BMNH labeled as: Himalaya(H)// Bowring. 63 47*(P)//Melolontha(S. G. Schonherria Burm. n. sp.)(H)(1 ♂). Allahauad(W)?//Bowring. 63 47*(P)//. Determined from description. G. J. A.(P) Melolontha alboplagiata Brsk(W)(1 ♀). Atkinson Coll. 92-3.(P)(1 ♂).

Distribution.—Eastern Himalayan areas, including Sikkim and Bhutan (new record) (Fig. 46).

Remarks.—In his original description, Brenske (1898) placed that *C. alboplagiata* with the typical *Melolontha* species and distinguished them from *M. albidiventris* Fairmaire, *M. cochinchinae* Brenske, *M. rubiginosa* Fairmaire, and *M. costata* Nonfried by differences of the clypeus, pygidium, and first antennal club segment of the females and therefore considered them as an unique group. We agree that *C. alboplagiata* should be recognized as an distinct group but we reject the concept of so-called typical *Melolontha* applied at that time because it does not satisfy today's systematic requirement and may cause more taxonomic uncertainty. However, after careful comparison of the types and other material, the systematic position of the above-mentioned species by Brenske (1898) within *Melolontha* suggest further revisionary work.

Clypeolontha bertiae Li and Yang, new species

(Figs. 7, 14, 20, 26, 32, 44)

Type series.—Holotype ♀ (deposited in NMNH) with label data in handwritting as follows: Pukhieo, Chiaya poon, NE Thailand, 5-V-1986, P. EK-Amnuay. 4 ♀ paratypes: one with the same data as holotype deposited in MNHN; one in ISNB, with label data as follows: Laos, Luang Prabang: Ban Na Gnan. 20. V. 1920. R. V. de Salvaza(P). Specimen (in ISNB) condition: right protarsus, middle and hind legs missing; anterior two segments of left protarsus missing. The remaining two paratypes is in BMNH with identical printed label data as follows: At light//N.E. Thailand: 800m., Phu Khieo Wildlife Sanctuary, 16°30′N, 101°46′E//Chaiyaphum Province, Khon San. 13–15. V.1988//Evergreen rain forest. M. J. D. Brendell. B. M. 1988-183.

Description.—Female. *Body:* Oblong (Fig. 7), dorsoventrally convex and sides subparallel medially. BL = 17.9–18.5 mm; BW = 7.8–7.9 mm; BL/BW = 2.28–2.35. *Head:* Deeply rufous brown to lightly reddish brown. Surface distinctly punctate, punctures large, each bearing a tiny, pale white to yellowish-brown seta, brighter on sides of eyes. Antenna 10-segmented with 6-segmented club; first club segment half to two-thirds length of rest; first basal segment subequal in length to third. Clypeus transverse, very shallowly depressed anterior to marginated edge; sides gradually rounding to biarcuate apex; middle of anterior margin inwardly depressed at tip; clypeo-frontal suture moderately developed. Labrum moderately grooved with respect to clypeus; transversally symmetrical, strongly bilobed, moderately declivous laterally, one-third width of clypeal base, visible dorsally, moderately protuberant. Maxillary palpus yellowish-brown; 4-segmented; apical palpomere spindly elongate, truncate, equal to combined length of segments 2–3 (Fig. 44); mean MPR = 2.0:1.5:3.5. Labial palpus 3-segmented; apical palpomere subcylindrical and glabrous.

Pronotum: Rufous brown. Moderately transverse, widest at middle, slightly narrowing posteriorly, disc moderately convex. Surface densely finely punctate, punctures evenly distributed, each with a pale white to yellow seta; anterior margin weakly

emarginate. Midline not visible. Discal sides of pronotum irregularly convex at middle, each with a shallow concavity (Fig. 14). Laterally, marginal serration poorly developed with feeble emargination; anterior and posterior angle weakly protuberant (Fig. 14). Scutellum wider than long, apically rounded, moderate in size.

Elytron: Brightly rufous yellow to rufous brown. Mean BW/HW = 1.73. Surface clothed with pale white to yellow setae; bearing 5 parallel costae on each elytron including along epipleural margin and sutural margins. Costae 2 and 3 fused on the apical knobs of elytron. Costae 4 very feebly developed and hardly visible. Intervals slightly impressed and with setiferous punctures throughout. Humeral knobs moderately swollen. Epipleuron with aligned row of smaller entire setae, broadest at middle. Lateral and apical margin membranous.

Thoracic sternites: Surface hairy except metepisternum and metepimeron densely covered with whitish-yellow scales with slight iridescent tinge (with illumination and magnification). Mesosternum transverse, surface of disc and mesometasternal suture depressed. Metasternum large, subquadrate, weakly depressed along middle groove.

Legs: Protibia tridentate, tooth color darker than disc; basal tooth somewhat obsolete; anterior spur movable, undersized, subequal to one-fourth the length of first protarsomere. Claws symmetrical, abruptly curved apically with a vertical subapical tooth at middle, two-thirds length of apical tooth. Pretarsus reddish brown; broadened laterally; protarsomere 1 longer than combined length of protarsomeres 2 and 3; PTR = 3.3:1.4:1.2:1.4:2.2 (n = 4). Pro- and mesofemora transversely flattened, surface densely clothed with long, yellowish-white pile. Meso- and metatibiae and tarsi lightly yellowish brown; metatarsal spurs reddish brown. Hind femur roundly inflated (Fig. 20) with shorter pile than those on pro- and mesofemora; MFL/W = 2.34–2.45.

Abdomen: Dorsoventrally inflated. Sternites transversely rugose, moderately punctate; segments 1–6 continuous with wide maculation along lateral edges consisting of white scales with weakly iridescent tinge. Intervening surface shallowly setiferously punctate with setae same as on dorsum, transversely intermixed with very sparse longer setae. Sternites 2–5 weakly fused medially, not well defined. Posterior edges of sternites 5 and 6 smooth, sternite 6 with feeble irregular serration (Fig. 26). Pygidium deeply reddish to lightly rufous brown; densely clothed with pale white to yellow setae sparsely intermixed with longer setae; triangular; in lateral view apex moderately elongate, smoothly declivous apically with apex sharpened (Fig. 32); marginate laterally then decreased apically. PgW/H = 1.08–1.12. Apex dorsoventrally with a terminal tuft of denser setae.

Distribution.—Some 200 km north of Vientiane, Laos, and the low montane area of northeastern Thailand (Fig. 46).

Remarks.—We describe *Clypeolontha bertiae* from only five females because those diagnostic characters found in the female types of *C. siamensis,* referring to both *C. siamensis* and *C. alboplgiata,* are useful and stable enough to separate interspecific females. Those distinguishing characters are given in the key.

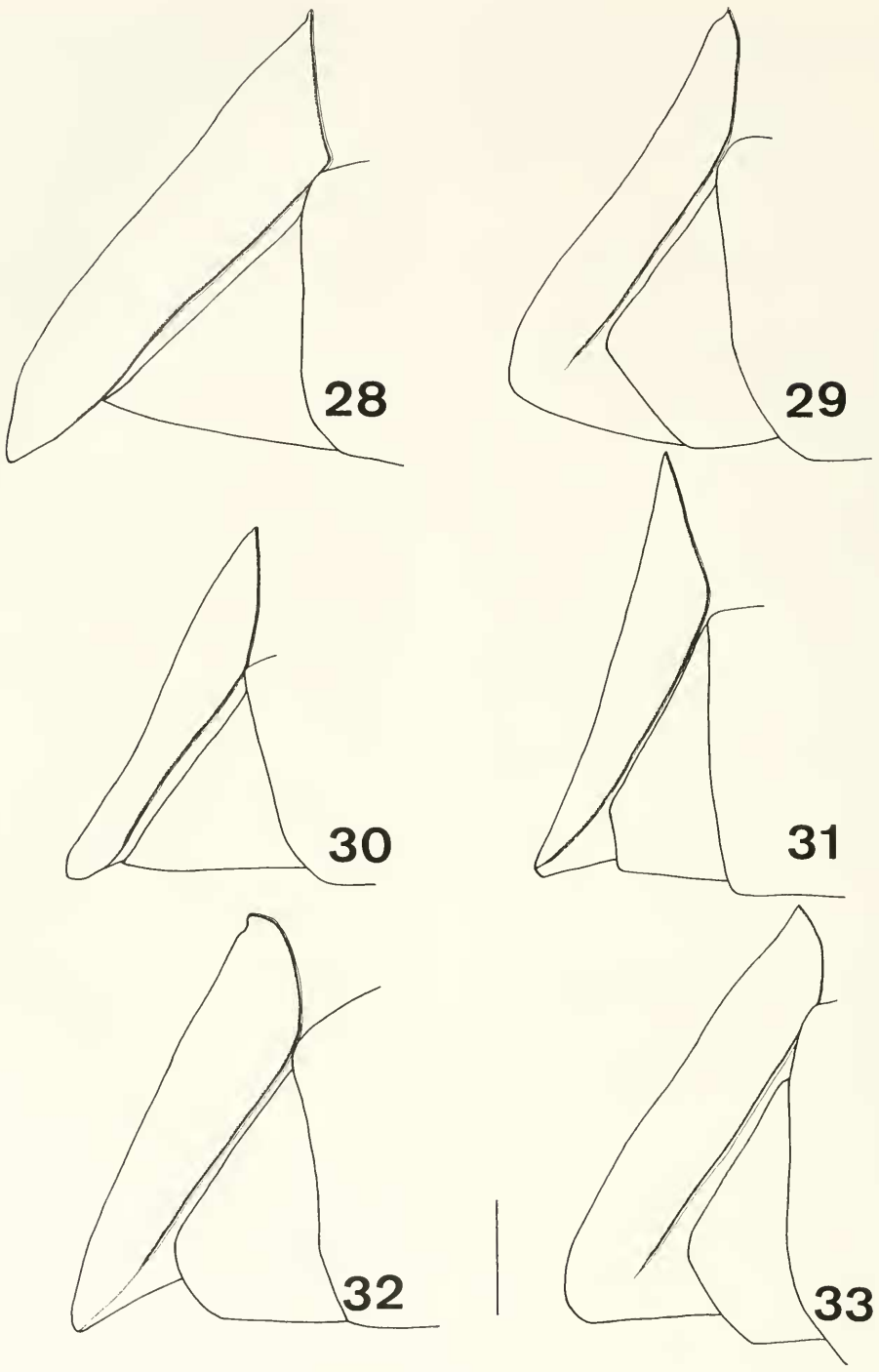
Etymology.—Named for Dr. Nicole Berti who helped the senior author at Muséum national d'Histoire naturelle, Paris, in 1997.

Clypeolontha laosensis Li and Yang, new species

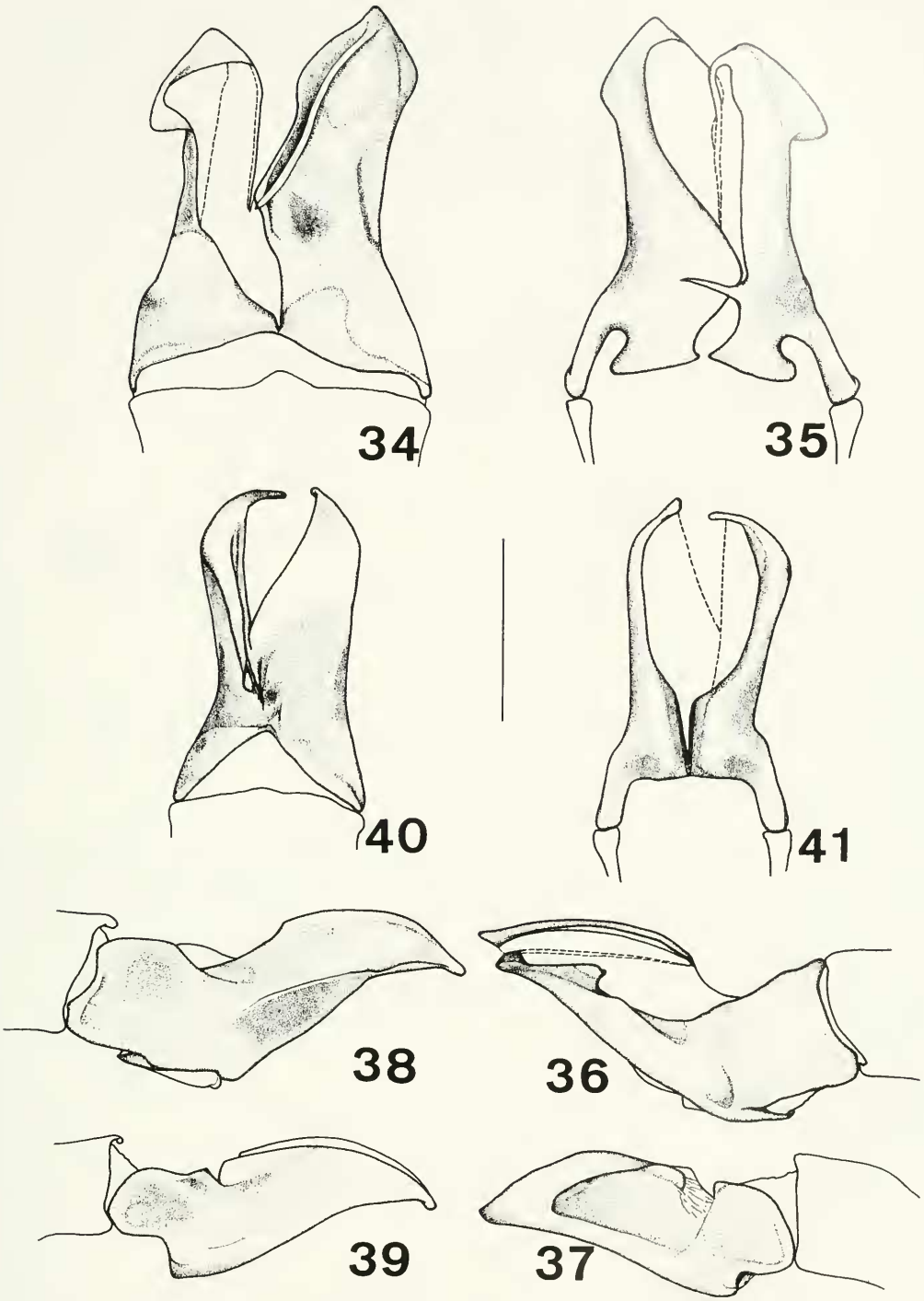
(Figs. 6, 15, 21, 27, 33, 45)

Type.—Holotype ♀ (deposited in ISNB) labeled as follows: Laos(P), Nam Tien(H), le(P), 14-IV(H), 191(P)8(H), R. Vitalis de Salvaza(P).

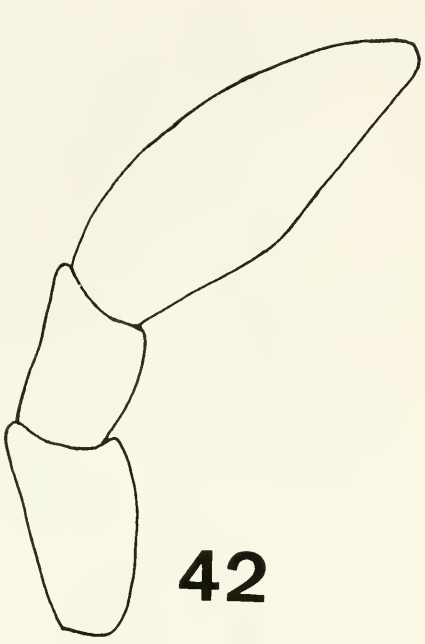
Description.—Female. *Body:* Oblong (Fig. 6), dorsoventrally convex and sides subparallel medially. BL = 17.2 mm; BW = 7.5 mm; BL/BW = 2.29. Basal color dark rufous brown. *Head:* Surface distinctly punctate, punctures large, each bearing a tiny, yellowish-brown seta, brighter on

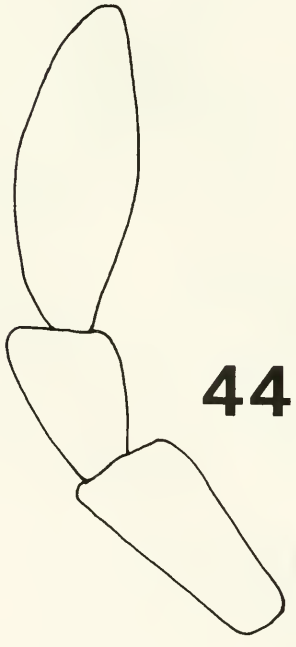


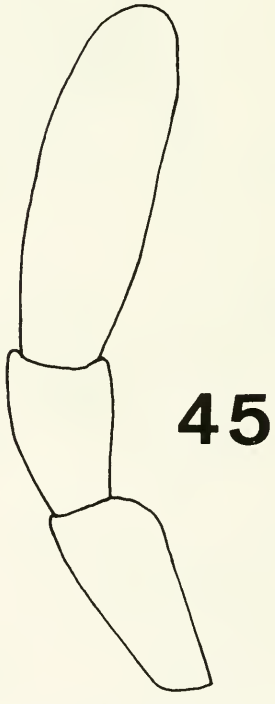
Figs. 28–33. Pygidium, right lateral view. 28, *Clypeolontha siamensis*, male. 29, *C. siamensis*, female. 30, *C. alboplagiata*, male. 31, *C. alboplagiata*, female. 32, *C. bertiae*, female. 33, *C. laosensis*, female. Scale line = 1.0 mm.



Figs. 34–41. Male genitalia. 34, 35, 36, 37, *Clypeolontha siamensis*. 38, 39, 40, 41, *C. alboplagiata*. 34, 40, Dorsal view. 36–37, Right lateral view. 38–39, Left lateral view. 35, 41, Ventral view. Scale line = 1.0 mm.







Figs. 42–45. Female outlined maxillary palpomeres 2–4. 42, *Clypeolontha siamensis*. 43, *C. alboplagiata*. 44, *C. bertiae*. 45, *C. laosensis*. Scale line = 0.5 mm.

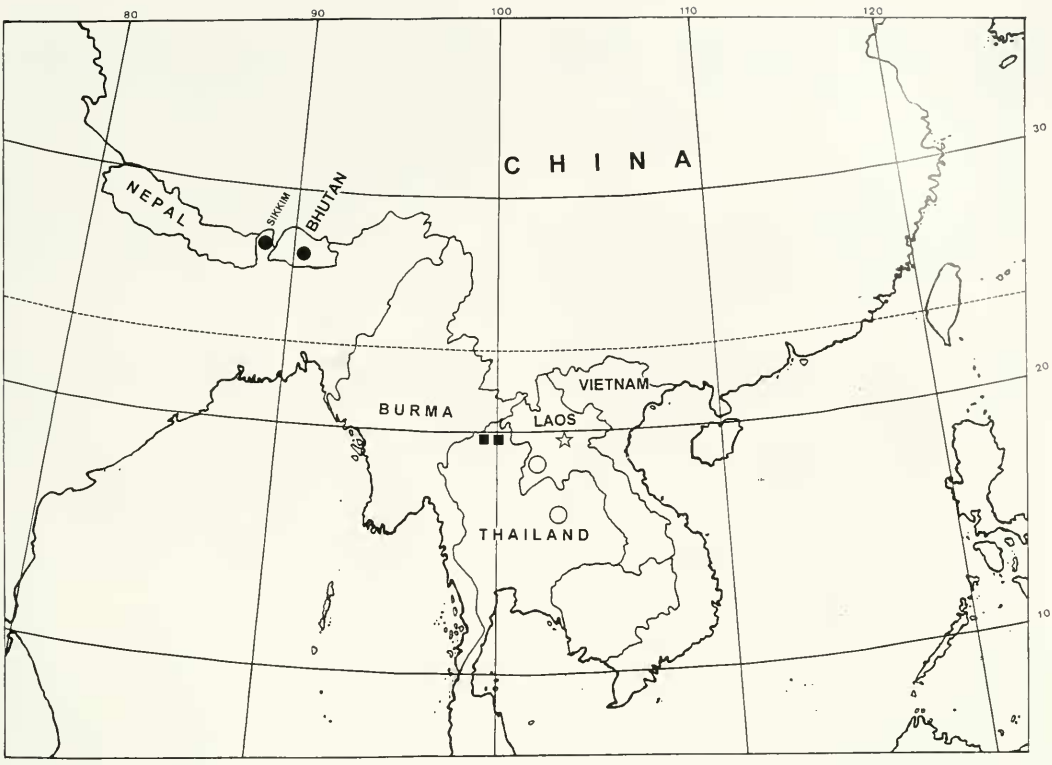


Fig. 46. Distribution. Solid square = *Clypeolontha siamensis*; solid circle = *C. alboplagiata*; open circle = *C. bertiae*; star = *C. laosensis*.

sides of eyes. Antenna 10-segmented with 6-segmented club; first club segment half length of rest; first basal segment subequal in length to third. Clypeus transverse, moderately depressed anterior to marginated edge; sides gradually rounding to biarcuate apex; middle of anterior margin inwardly depressed at tip; clypeo-frontal suture moderately developed. Labrum moderately grooved with respect to clypeus; transversally symmetrical, strongly bilobed, moderately declivous laterally, one-third width of clypeal base, visible dorsally, moderately protuberant. Maxillary palpus dark yellowish brown; 4-segmented; apical palpomere spindly stout, truncate, shorter than combined length of segments 2–3 (Fig. 45); MPR = 1.8:1.3:2.7. Labial palpus 3-segmented; apical palpomere subcylindrical and glabrous.

Pronotum: Moderately transverse, widest at middle, slightly narrowing posteriorly, weakly convex. Surface densely punctate, punctures more or less irregularly distributed, each with a pale white seta; anterior margin weakly emarginate. Midline very shallowly depressed, clothed with very tiny, brownish setae. Discal sides of pronotum irregularly convex at middle, each with a vestigial concavity (Fig. 15). Laterally, marginal serration poorly developed with feeble emargination; anterior angle acute, protuberant; posterior angle obstuse (Fig. 15). Scutellum wider than long, apically rounded, moderate in size.

Elytron: BW/HW = 1.91. Surface clothed with pale white setae, tending yellow basally; bearing 5 parallel costae on each elytron including along epipleural margin and sutural margin. Costae 2 and 3 fused on the apical knobs of elytron. Costae 4 very feebly developed and hardly visible.

Intervals slightly impressed and with setiferous punctures throughout. Humeral knobs moderately swollen. Epipleuron with aligned row of smaller, brownish entire setae, broadest at middle. Lateral and apical margins membranous.

Thoracic sternites: Surface hairy except metepisternum and metepimeron densely covered with whitish-yellow scales with slight iridescent tinge (with illumination and magnification). Mesosternum transverse, surface of disc and mesometasternal suture depressed. Metasternum large, subquadrate, weakly depressed along middle groove.

Legs: Protibia tridentate, tooth color distinctly darker than disc; basal tooth somewhat obsolete; anterior spur movable, undersized, subequal to one-third length of first protarsomere. Claws symmetrical, abruptly curved apically with a vertical subapical tooth at middle, two-thirds length of apical tooth. Pretarsus dark yellowish brown; broadened laterally; protarsomere 1 longer than combined length of protarsomeres 2 and 3; PTR = 3.0: 1.4:1.2:1.2:2.3. Femora dark rufous brown. Pro- and mesofemora transversely flattened, surface densely clothed with long, yellowish-white pile. Hind femur slightly transversely inflated (Fig. 21) with shorter pile than those on pro- and mesofemora; MFL/W = 2.61. Tibiae and tarsi moderately clothed with pale white setae. Meso- and metatibia with 2 elongate, apical spurs, outer spur of metatibiae sharper and slightly longer than length of metatarsomere 1, inner spur curved apically. Meso- and metatarsi dark yellowish brown with tarsomeres 1–5 subequal in length.

Abdomen: Dorsoventrally inflated. Sternites transversely rugose, moderately punctate; segments 1–6 continuous with wide maculation along lateral edges consisting of white scales with weakly iridescent tinge. Intervening surface shallowly setiferous punctate with whitish-yellow setae; transversely intermixed with very sparsely longer setae. Sternites 2–5 weakly fused medially, not well defined. Posterior edge of sternite 5 with distinct point-curve, sternite 6 deeply, broadly emarginate (Fig. 27). Pygidium reddish brown; wider than long; triangular; densely clothed with yellowish-brown setae sparsely intermixed with longer setae; in lateral view, apex slightly elongate, smoothly declivous apically with apex rounded (Fig. 33); marginate laterally and smooth apically. PgW/H = 1.18. Apex dorsoventrally with a terminal tuft of denser setae.

Distribution.—Northern Laos, roughly 19°34′N, 103°42′E (Fig. 46).

Remarks.—*Clypeolontha laosensis* is described from a single female. Geographically and morphologically, it is close to *C. bertiae,* but it may be separated from it by the diagnostic characters in the key.

Etymology.—The specific epithet is from the country of collection.

Acknowledgments

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